# Observation of $^{271}110$

*T. N. Ginter,* R. Eichler,† C. M. Folden,*‡ K. E. Gregorich,* D. C. Hoffman,*‡ U. W. Kirbach,* D. M. Lee,* W. Loveland,§ V. Ninov,* H. Nitsche,*‡ J. B. Patin,*‡ N. K. Seward,**, R. Sudowe,* P. A. Wilk,*‡ P. M. Zielinski,*‡*

The LBNL Heavy Element Group completed an experiment that confirms the observation [1] at GSI of the isotope $^{271}110$. This experiment used the Berkeley Gas-filled Separator (BGS) to isolate products from the reaction $^{208}Pb(^{64}Ni,1n)^{271}110$ for study. (Experiments at GSI employed the velocity filter SHIP to study products from the same reaction.)

The 88-inch cyclotron facility supplied a beam of $^{64}Ni$ at a charge state of $14^+$ for the LBNL experiment. The experiment took place over a period of seven days with beam intensities of about 4 electrical μA. Beam energies of 312.5, 315, and 317.5 MeV were used with doses of $5.7 \times 10^{17}$, $6.1 \times 10^{17}$, and $1.5 \times 10^{17}$, respectively. Particle detectors placed at the BGS target position monitored the beam intensity based on the number of events detected arising from Rutherford scattering.

The beam entered the BGS through an entrance window made of a 40 $\mu g/cm^2$ carbon foil. The pressure of the He gas used in the separator was 0.88 Torr. The target consisted of isotopically enriched $^{208}Pb$ deposited to a thickness of 400 $\mu g/cm^2$ on 40 $\mu g/cm^2$ carbon foils that were placed facing the beam. The target was rotated to minimize the thermal stress arising from the high beam intensity. The transmission efficiencey of the BGS is estimated to be about 50% for this reaction

The detector setup at the BGS focal plane consisted of a silicon strip detector with 32 vertical strips. Resistive readout of signals from each strip provided position information on events detected within a given strip. The size of this detector was 11.6 cm horizontally by 5.8 cm vertically; it has an efficiency of 50% for recording alpha-decay events. The focal plane setup also featured a parallel plane avalanche counter (PPAC) placed in front of the strip detector. Time-of-flight signals between the PPAC and the strip detector were used to distinguish if signals observed in the strip detector arose from the implantation of ions into the detector or from the alpha-decay of atoms already present in the detector.

During the beam irradiation at 315 MeV one decay chain was observed. Table I below summarizes the characteristics of this chain. The three alpha-decay events listed in Table I (together with the preceding implantation event that is not listed) occurred within a narrow position window within strip 27.

**Table I.** Decay chain for $^{271}110$ observed at the BGS. The third column gives the time interval between the listed alpha-decay and the previous event (the implantation event for $^{271}110$ or the previous alpha-decay for $^{267}Hs$ and $^{263}Sg$).

| Isotope | $E_\alpha$ (MeV) | Δt (ms) |
|---|---|---|
| $^{271}110$ | 10.77 | 2.828 |
| $^{267}Hs$ | 9.94 | 15.320 |
| $^{263}Sg$ | 9.28 | 400.610 |

*Footnotes and References*

* Nuclear Science Division, LBNL

† Paul Scherrer Institute, Switzerland

‡ Chemistry Department, U. C. Berkeley

§ Chemistry Department, Oregon State U.

****** Physics Department, University of Surrey, UK

††Highlight and Type Footnote here or omit

1. S. Hofmann, "New elements--approaching Z = 114", Rep. Prog. Phys. **61**, 639 (1998); S. Hofmann et al., "Production and Decay of $^{269}110$ and $^{271}110$", GSI-Nachrichten Report No. **94-1**, 12 (1995).